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🔍 **Title:** **EP0695622B1: Method and apparatus for plasma modification of flat porous articles**[\[German\]](#)[\[French\]](#)

🔍 **Derwent Title:** Modification of flat porous substrates e.g. textiles or paper - uses plasma chamber with process gas having pressure difference on inlet and outlet sides of substrate to ensure flow through substrate
[\[Derwent Record\]](#)

🔍 **Country:** EP European Patent Office (EPO)

🔍 **Kind:** B1 Patent ¹ (See also: [EP0695622A2](#), [EP0695622A3](#))

🔍 **Inventor:** **Oehr, Christian;**
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Vohrer, Uwe;
Müller, Michael;

🔍 **Assignee:** **Fraunhofer-Gesellschaft zur Förderung der angewandten Forschung e.V.**

🌳 *Corporate Tree data:* [Fraunhofer Gesellschaft \(FRAUNHOFER \)](#);
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🔍 **Published / Filed:** **2001-11-14 / 1995-07-24**

🔍 **Application Number:** **EP199500011614**

🔍 **IPC Code:** Advanced: [B05D 7/24](#); [B29C 59/14](#); [C23C 16/04](#); [C23C 16/54](#); [D06M 10/02](#); [D06M 14/18](#); [D06M 14/20](#); [D06M 14/28](#); [D06M 14/34](#); [H01J 37/32](#);
Core: [B29C 59/00](#); [D06M 10/00](#); [D06M 14/00](#); more...
IPC-7: [B29C 59/14](#); [B29K 77/00](#); [D06M 10/00](#);

🔍 **ECLA Code:** **B05D7/24E**; [B29C59/14](#); [C23C16/04D](#); [C23C16/54B](#); [D06M10/02B](#); [D06M14/18](#); [D06M14/20](#); [D06M14/28](#); [D06M14/34](#); [H01J37/32D](#);

🔍 **Priority Number:** 1994-07-22 **DE1994004426229**
1994-09-15 **DE1994004432919**

🔍 **Abstract:** [\[From equivalent EP0695622A2\]](#) Modification of flat porous substrates e.g. textiles or paper In a process for modification of flat substrates (7) using a low pressure plasma, pressure difference is maintained between process gas inlet (5) and outlet (6) on opposing sides of the treated substrate, e.g. a fabric, to ensure plasma flow through the substrate (7). Process appts. comprises a reaction chamber (1) with a HF generator (2), a perforated first electrode (3) and a flat opposing electrode (4). A process gas inlet (5) and outlet (6) ensure flow between both electrodes (3, 4) and through the perforations in the first electrode (3). Also claimed is a plasma-modified substrate with a 0.6-1.2 wt. 0 deposited coating. [\[German\]](#)

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🔍 **Designated** AT BE CH DE FR IT LI LU NL

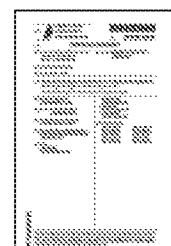
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🔍 **Family:** [Show 7 known family members](#)

🔍 **Claims:**

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1. Method for modifying flat porous objects with the aid of a low-pressure plasma, wherein the plasma chamber containing the flat porous object is brought before the ignition of the plasma to a base

High
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inner pressure of the initial gases of ≤ 0.05 mbar, then reaction gas is introduced into the chamber, and during the treatment a pressure difference between the upper and the lower sides of the fabric is maintained in such a way that the plasma flows through the flat object, **characterised in that** the flat object lies on an open-work flat electrode during the plasma treatment.

2. Method for modifying flat objects with the aid of a low-pressure plasma, **characterised in that** the reaction gas used contains reagents which can react chemically with flat porous objects even at the inner surfaces and/or form polymer coatings.

3. Method according to claim 2, **characterised in that** the reagents optionally are or include hydrocarbons, silanes or siloxanes containing partially fluorinated or perfluorinated and/or unsaturated groups.

4. Method according to claim 2, **characterised in that** the reagents contain one unsaturated group and at least one methyl-, trifluoromethyl-, -tert-butyl or perfluoro-tert-butyl group.

5. Method according to one of the preceding claims, **characterised in that** the plasma acts on the flat object for between 1 second and 2 hours at a pressure of 0.1 to 5 mbar, with a gas flow of 1 to 1000 sccm and/or a power density of 10 mW/cm² - 250 mW/cm².

6. Method according to one of claims 1 to 5, **characterised in that** pre-treatment, in particular drying or activation, is inserted.

7. Method according to one of the preceding claims, **characterised in that** after plasma activation, the flat object is grafted with at least one of the reagents named in claims 2 to 4, or after-treated in some other suitable manner.

8. Apparatus for treating flat objects with a low-pressure plasma, comprising a reaction chamber (1) with a high-frequency generator (2) and at least one first electrode (3) of the generator, which is configured as an open-work or perforated flat electrode, and a second electrode (4) as the counter-electrode which is also configured as a flat electrode, the second electrode being matched in its geometry to the geometry of the open-work flat electrode, the chamber having a feed device (5) and an outlet (6) for a process gas, which are disposed in relation to one another in such a way that the gas on its way from the inlet to the outlet sweeps over the space between the two flat electrodes, can be excited there into a plasma and passes through the apertures of the open-work flat electrode when a pressure difference between gas inlet and gas outlet is maintained, **characterised in that** means are provided to secure the flat object or deflection rollers between the two electrodes, which hold or guide the flat object in direct contact with the first electrode.

9. Apparatus according to claim 8, **characterised in that** the open-work or perforated electrode is an electrode shaped convex.

10. Apparatus according to one of claims 8 or 9, **characterised in that** the open-work or perforated flat electrode (3) is in the shape of a rotary drum and the counter-electrode (4) is in the shape of a hollow cylinder segment concentric with the drum electrode.

11. Apparatus according to one of claims 8 to 10, **characterised in that** the process gases are guided through apertures in the counter-electrode (4) into the space between the electrodes.

12. Apparatus according to one of claims 8 to 11, **characterised in that** the space between the electrodes is sealed by means of a shield apart from two gaps for continuously guiding the flat object to and from the rotary drum.

13. Apparatus according to one of claims 8 to 12, **characterised in that** a plurality of plasma treatment chambers (1) are disposed the one behind the other.

14. Apparatus according to one of claims 8 to 13, **characterised in that** deflection rollers are provided, with the aid of which the web-type goods can be so guided that they are exposed to the plasma once or several times on the front side and then once or several times from the rear side.

15. Flat object modified by means of a plasma method,

characterised in that that it is or contains an aramid fabric and its capacity for absorbing water is reduced to 30% of the original value by a coating with roughly 0.6 to 1.2 wt.-% thickness of the deposits generated by the plasma gas.

[German] [French]

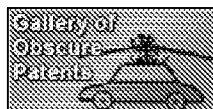
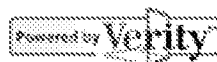
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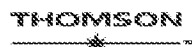
Die vorliegende Erfindung betrifft die Modifizierung der Oberflächen von flächigen porösen Gegenständen wie Textilien, Membranen oder Papier und deren inneren Oberflächen mit Hilfe von in Niederdruckplasma angeregten Reagenzien. Die Modifizierung geschieht durch Anbindung von chemischen Gruppen oder auch durch Abscheidung von Schichten mit anderen chemischen, physikalischen und morphologischen Eigenschaften als denen der Substrate.

Other Abstract Info:

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